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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/727,187

12/02/2003

Michael D. Jack

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06/01/2006

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EXAMINER

BOOSALIS, FANI POLYZOS

ART UNIT

PAPER NUMBER

2884

DATE MAILED: 06/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/727,187

Applicant(s)

JACK ET AL.

Examiner

Faye Boosalis

Art Unit

2884

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-10 and 12-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10 and 12-16 is/are allowed.
- 6) ☒ Claim(s) 1,4 and 7-9 is/are rejected.
- 7) ☒ Claim(s) 3,5 and 6 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 6 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Comment on Submissions

1. This communication is responsive to submissions 20 March 2006.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claim 1, 4 and 8-9 are rejected under 35 U.S.C. 102(b) as being anticipated by *Rice et al. (Journal paper entitled "High-Tc Superconducting Antenna-coupled Microbolometer on Silicon")*.

Regarding claim 1, Rice discloses a radiation sensor comprising: a substrate (Si) defining a cavity (etch pitch) (page 98, lines 2 of 3rd paragraph); an antenna supported by the substrate (Fig. 1a and page 99, 1st paragraph under the heading "Design"); a thermal detector unit (i.e. microbolometer) spaced from the antenna and from the substrate (Fig. 1b and 3b); a plurality of multi-layered conductive leads comprises a superconductive layer (YBCO) in electrical contact with the thermal detector unit and the antenna, a support layer (YSZ) between the superconductive layer and the substrate (page 99 1st paragraph under the heading "Design"), and a buffer layer (CeO₂) disposed between the support layer and the superconductive layer, each of the support layers cooperating to suspend the thermal detector unit over the cavity (page 102 1st paragraph and 2nd paragraph under the heading "Fabrication").

Regarding claim 4, Rice discloses the buffer layer, comprises Yttria stabilized Zirconia (page 98 1st paragraph under the heading "Abstract").

Regarding claim 8, Rice discloses a radiation sensor for measuring incident radiation comprising a substrate (Si) defining a cavity (etch pitch) (page 98, lines 2 of 3rd paragraph); a thermal detector unit (i.e. microbolometer) disposed above the cavity (Fig. 1b and 3b), an antenna coupled to the substrate (Fig. 1a and page 99, 1st paragraph under the heading "Design"); and a plurality of conductors in contact with the antenna and the thermal detector unit, the improvement comprising: each of the plurality of conductors defining a plurality of layers and comprising: a superconductor layer (YBCO); a support layer (YSZ) between the conductive layer and the substrate (Si); and a buffer layer (CeO₂) between the support layer and the superconductive layer (Fig. 1b and 3b and page 99 1st paragraph under the heading "Design"); wherein each of the support layers cooperate to suspend the thermal detector unit over the cavity (page 102 1st paragraph and 2nd paragraph under the heading "Fabrication").

Regarding claim 9, Rice discloses a radiation sensor for measuring incident radiation comprising a substrate (Si) defining a cavity (etch pitch) (page 98, lines 2 of 3rd paragraph); a thermal detector unit (i.e. microbolometer) disposed above the cavity (Fig. 1b and 3b), an antenna coupled to the substrate (Fig. 1a and page 99, 1st paragraph under the heading "Design"); and a plurality of conductors in contact with the antenna and the thermal detector unit, the improvement comprising: each of the plurality of conductors defining a multi-layer structure comprising: a support layer (YSZ) adjacent to the substrate; a superconductor layer (YBCO) opposite the substrate; and a buffer

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layer (CeO_2) between the support layer and the superconductive layer (Fig. 1b and 3b and page 99 1st paragraph under the heading "Design"); wherein each of the support layers cooperate to suspend the thermal detector unit over the cavity (page 102 1st paragraph and 2nd paragraph under the heading "Fabrication").

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Rice et al.* (Journal paper entitled "High-T_c Superconducting Antenna-coupled Microbolometer on Silicon") as applied to claim 1 above, and further in view of *Ooms et al* (US 6,563,118 B2).

Regarding claim 7, Rice discloses a radiation sensor comprising: a substrate (Si) defining a cavity (etch pitch) (page 98, lines 2 of 3rd paragraph); an antenna supported by the substrate (Fig. 1a and page 99, 1st paragraph under the heading "Design"); a thermal detector unit (i.e. microbolometer) spaced from the antenna and from the substrate (Fig. 1b and 3b); a plurality of multi-layered conductive leads comprises a superconductive layer (YBCO) in electrical contact with the thermal detector unit and the antenna, a support layer (YSZ) between the superconductive layer and the substrate (page 99 1st paragraph under the heading "Design"), and a buffer layer (CeO_2) disposed between the support layer and the superconductive layer, each of the

support layers cooperating to suspend the thermal detector unit over the cavity. Rice does not disclose of the superconductive layer selected from a group of perovskite superconductors. Ooms discloses semiconductive layer consisting of perovskite superconductors (col. 1, lines 14-21). Ooms teaches various metallic oxides, such as perovskites, exhibit desirable characteristics such as piezoelectric, pyroelectric, ferroelectric, ferromagnetic, colossal magnetic resistance and super conductive properties. Such oxides may be included or used in connection with microelectronic devices that take advantage of these characteristics (col. 1, lines 14-21). Therefore, it would have been obvious to modify the radiation sensor disclosed by Rice, to include a semiconductor layer consisting of perovskite superconductors, as disclosed supra by Ooms, to allow for a more versatile apparatus.

Allowable Subject Matter

6. Claims 10 and 12-16 are allowed.

7. The following is an examiner's statement of reasons for allowance:

Regarding independent claim 10, the prior art does not disclose or fairly suggest a method for making a radiation sensor comprising: a plurality of multi-layer conductive leads (i.e. superconductive layer, support layer and buffer layer) defining a multi-layer structure comprising: depositing a filler material within a cavity of the substrate and removing the filler material such that the support layers suspend the thermal detector unit (i.e. microbolometer) over the cavity.

The examiner notes that while it is known in the art of a method for making a radiation sensor for measuring incident radiation comprising: defining a substrate;

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thermal conductor unit and an antenna and depositing a multi-layered conductive lead comprising three layers (YSZ layer, YBCO layer and Au Layer) at the antenna portion of the sensor (*see for example – Rice et al – “High- T_c superconducting antenna-coupled microbolometer on silicon” -- Figs. 1a, 1b and 2c*) and disposing a sacrificial layer onto a substrate and etch into the sacrificial layer and etched underneath the substrate, a pit or undercut, to form an air bridge (*see for example – Luukanen et al – 2003/0222217 A1 -- Figs. 3 and paragraph [0031]*), the prior art does not suggest a method for depositing a plurality of multi-layer conductive leads to deposit filler material in the cavity after the cavity is defined in the substrate.

The remaining claims 12-16 are allowable based on their dependency.

8. Claims 3 and 5-6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding dependent claim 3, the prior art, as stated supra, does not disclose or fairly suggest of a radiation sensor comprising a buffer layer wherein the buffer layer is characterized by a thermal conductivity $K < 0.1 \text{ W/cm-K}$.

Regarding claims 5-6, the prior art, as stated supra, does not disclose or fairly suggest of a radiation sensor comprising a buffer layer wherein the buffer layer defines a thermal conductivity that is less than one order of magnitude greater than a thermal conductivity defined by the superconductive layer (YBCO) (page 99 1st paragraph).

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Conclusion


9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Faye Boosalis whose telephone number is 571-272-2447. The examiner can normally be reached on Monday thru Friday from 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

FB


OTILIA GABOR
PRIMARY EXAMINER